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Borided steel topography and phase contrast in tapping mode

U.L. Mishigdorzhiyn

Department of Metals Science and Materials Processing Technology, East Siberia State University of Technology and Management, 670013, Ulan-Ude, Russia
e-mail: druh@mail.ru

It is known, that atomic force microscopy (AFM) analysis is powerful instrument of surface characterization, such as phase-contrast imaging and topography. However, fewer literature sources devoted to AFM application in thermochemical surface treatment investigations, for instance in boriding. One of the problems that researchers face while observing hardened layers, such as boronized ones, is uneven surface topography, which prevents the adequate phase contrast, based on elastic modulus data. The paper presents results of AFM analysis of carbon and alloyed steel after boriding in boron carbide containing pastes. Aluminum powder was added to boriding media for layer's brittleness reducing and microstructure transformation. Topography and phase map of borided layer's cross sections were investigated by means of AFM in tapping mode. Empirically the research area of 25x25 μm was defined. Etching positive effect upon topography data was revealed due to surface oxidation after etching. In addition to cross sections, the treated surface topography and phase map were analyzed as well. Based on these data, morphology and crystal orientation of iron borides were established. Elongated crystals topography and phase map is different from cross section one, where elongated crystals were observed.